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PICPAC: A PDP-6 Picture Package

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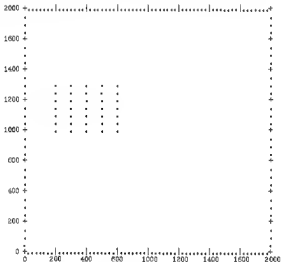
ABSTRACT

PICPAC is a PDP-6 program to be used for manipulating pictures of real-world scenes. It operates under ITS (the Incompatible Time-Sharing System) under control of a simple on-line command language. It includes facilities for reading pictures from either vidisceter, for reading and writing them on disk or microtape, and for displaying or plotting them. It also includes focusing and control functions.

# PICTURE SPACE

The picture can be thought of as a finite subset of a square. One can consider the square to be either 1.0 x 1.0, using floating-point numbers to refer to coordinates, or a 1024 x 1024 square, using fixed-point numbers. We will use the latter convention in the sequel.

In the diagram below (Figure 1), the picture is a 5x7 array, with its LLC (lower-left-hand corner) point at (200,1000), and with a separation of 100 between successive points in the x-direction and 40 in the y-direction.



A Picture Array  
Figure 1

## DISPLAY OF PICTURE FRAME AND PARAMETERS

The outline of the picture, as well as the values of the parameters defining the geometry of the picture, are displayed on the 340 CRT. A typical display is shown in Figure 2:



Picture Frame and Parameter Display  
Figure 2

The rectangle shows that the picture frame is 1000x400, with its LLNC at (100,400). The smaller rectangle in the LLNC of the larger shows that the spacing between successive points is 40 in the horizontal direction and 20 in the vertical direction.

The value of each parameter, as well as what controls it, is shown by the text material at the upper left. The general form is "pp(c)cv", where pp is the parameter name, c indicates the variable controlling the parameter, and v is the current value of the parameter.

pp may be: XD or YO (the abscissa and ordinate of the LLNC of the picture frame), DX or DY (the spacing between successive points in the horizontal and vertical directions), WH or HW (the horizontal and vertical dimensions), WD or HT (the width and height of the frame), or SC, the scaling factor for the Halway plot.

c may be F, \*, X, Y, or a digit i between 0 and 7. F means that the parameter is fixed at the last value typed in. \* means that it is a dependent variable. i or j means that the parameter is controlled by the horizontal or vertical joystick pot, while a digit i means that it is controlled by the i-th pot in the pot-box (strictly labeled 140+i).

The value v is equal.

The intensity i and scale s with which these characters are

displayed can be set by typing the commands UPI and UPF, respectively. In the situation producing Figure 2, XD is under control of the joystick, but it has been moved so far to the right that the rectangle leaves the edge of the screen; thus XD is controlled at the moment not by the joystick, but by an inequality condition. This is indicated by the asterisk.

The LLSC of the frame can be set by the joystick (role X and Y), or by the TTE. Type g1 to set XD to g, gN to set YD to g, and g, gN to set both.

EX and EY are set similarly by g, gN, D, while XN and YN are set by g, gN, H.

To freeze a variable to its present value, type F as the "value", e.g., FM would freeze YM at 25, and the displayed line would change to "YM(T)=25".

Type IT (control-T) to unfreeze a parameter.

Numbers may be typed in as decimal, floating, or octal. A number is decimal if it has a terminal period, floating if it has a non-terminal period; otherwise it is octal. The width of the screen expressed in these three ways is 1024, 2000, and 1.0, respectively. Thus note that teleports count points, while floating-point numbers express a fraction of the whole.

## POT BOX

The pot box can be used to control the variables UX, UY, EX, and EC. The values of the pots are transformed by taking the logarithm and (in the case of EX and EC) truncating.

If the user finds the parity or sense of pot 140 not satisfying, he may invert it by typing the command xPR, where x=2\*.

## VIDISSECTING

A picture may be read from one of three devices, designated 0, 1, 2:

<u>X</u>	<u>Device</u>
0	Old vidiasector
1	Old vidiasector, new interface
2	New vidiasector

For 0 or 1, the two interface switches on the old vidiasector must be set properly.

Check that power is on, lens cap off, sufficient light on scene, vidiasector focused properly, low/linear switch in the lag position, etc.

Type L, g, gN to read in a picture defined by the parameters from vidiasector L. For L = 1 or 2, g defines the signal/noise ratio (0 = smallest ratio & fastest, 3 = largest ratio & slowest), while g defines the dark cutoff (0 = darkest cutoff & most pattern, 7 = lightest cutoff & least pattern). g and g are irrelevant for L=0. Invert on any of

these fields will leave the corresponding parameter unchanged.

The picture values read in will be stored in an array in 8-bit bytes. Each byte represents the logarithm of an intensity, 0 being darkest, and 777 being brightest.

If the picture produced by the current vidiosector is inverted, either left-right or top-bottom (or both), typing the commands PX or PY, respectively, will correct the condition.

An ongoing vidiosector read may be aborted by typing hall (control 0).

#### INTENSITY-MODULATED PLOT

The current picture can be displayed as an intensity-modulated plot on the CRT (See Figure 3). Each of the XPMYM points of the picture is displayed at its proper position on the CRT with an intensity determined as follows: The set of all non-zero vidiosector values occurring in the picture is put in increasing order, and divided into eight essentially equal intervals. To a value in the i-th interval ( $i=0, \dots, 7$ ) is assigned CRT intensity  $i$ .

```
X0(X) = 365      Y0(Y) = 410  
DX(X) = 4        DY(Y) = 4  
XN(1) = 228      YN(5) = 297  
WD(x) = 1474     MT(x) = 1030  
SC(7) = 13
```



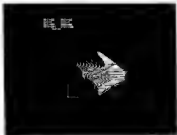
Intensity-Modulated Plot of a Book  
Figure 3

Type I to turn this display on, and type II (control 1) to turn it off. If a new picture is read in while the intensity display is on, the display will be updated automatically.

## HOLLOWAY PLOT

The current picture can be displayed as a Holloway plot on the CRT (See Figure 4). The first row of the picture, and every  $\Delta y$ -th row thereafter is plotted on the CRT in the following manner: if the point  $(x,y)$  of the picture has widthsector value  $z$ , then a point is plotted at  $(x,y+sc*z)$ , with intensity determined by the PE command, and  $sc$  determined by pet 167.

```
Xs(X) = 365    Ys(Y) = 410
DX(T) = 4      DY(T) = 4
XN(1) = 220    YN(S) = 267
WD(a) = 1074   HT(x) = 1630
SC(7) = 1
```



Holloway Plot of a Book  
Figure 4

## WRITING AND READING PICTURES ON TAPE OR DISK

PICPAC can be used to write pictures as files on microtape or disk, and to read pictures from such files. The format of such files is LISP compatible. Use

```
  aEnamel name25
or aEEnamel name25
to write to or read from file name1 name2 on unit  $u$ :  $u=0$  means
microtape  $u$ , while  $u \neq 0$  means disk  $-u$ .
```

Type help to short an ongoing ER or EW.

A current intensity plot or Holloway plot will be updated after  
as ER.

## QUITTING

Typing "Q" will tidy up the core image of PICPAC, and return control to the superior procedure. PICPAC may then be dumped with the current parameter and variable settings intact, and restarted without these quantities being disturbed.

## COMMANDE

In the descriptions below:

name1 name2 signify a file name consisting of one or two subwords.

f or g specify a number, floating point or integer. A string of digits containing a non-terminal period is taken to be floating decimal.

m or n specify an integer. A string of digits terminated by period (.) is taken to be decimal, otherwise octal.

i signifies an optional disk or microtape unit number. t=0 signifies disk -1. If not given, the most recent explicit i is assumed.

x signifies an optional vidiasector unit number. If not given, the most recent explicit x is assumed.

A minus-sign (-) may precede an m, n, f, or g.

If an argument is omitted in a D, N, or X, the corresponding parameter is left unchanged.

f, g Set dx to f and dy to g.

i name1 name2

Read in picture and picture parameters from file name1 name2 on unit i.

i name1 name2

Write picture and picture parameters on unit i as file name1 name2.

vF Read vidiasector F, using parameters x0, y0, xdia and dx to control the sample points.

D Display Holloway plot of current picture.

I Display intensity-modulated plot of current picture.

m, n Set xdia to m and ydia to n.

mPD Set pdia to m.

mF Set intensity for Holloway plots to m.

mPi Set intensity of window display characters to m.

mPP Invert parity of selected pots (dot box only).

mPS Set scale of window display characters to m.

PI Invert vidiasector i parity.

PI Invert vidiasector x parity.

Q Quit.

T Pseudo-argument: equivalent to typing "-1" as argument.

v, x, dy Read in picture from vidiasector x, with signal/noise ratio g and dark cutoff g.

f, g, x Set x0 to f and y0 to g.

! (bell) Terminate current command.

! Turn off Holloway display.

! Turn off intensity-modulated display.

! Pseudo-argument: equivalent to typing "-2" as argument.